

Common Factors

Factor the number 40.

$$40 = \underline{2 \times 2 \times 2 \times 5}$$

What does it mean to factor?

Represent as a product of prime factors.

$$2 \times 20$$

$$\swarrow \searrow$$

$$2 \quad 10$$

$$\swarrow \searrow$$

$$2 \quad 5$$

1. Using a Model (e.g., alge-tiles)

Model the expression as an area. The lengths of the sides are factors.

Some factors can be reduced further. Repeat this process until no factors can be reduced.

x^2
 \times
 x
 1

$-x^2$
 \times
 $-x$
 -1

Factor: $\frac{3x^2}{x} + \frac{2x}{x} \rightarrow x(3x+2)$

	x	x	x	1	1
\times	x^2	x^2	x^2	x	x

Factor: $2x^2 + 4x \rightarrow 2x(x + 2)$

Diagram illustrating the factoring process using algebra tiles:

- Top row: x^2 tile, x tile, 1 tile.
- Bottom row: $-x^2$ tile, $-x$ tile, -1 tile.

Factoring example:

Factor: $2x^2 + 4x$

Diagram showing the factoring process using algebra tiles:

- Top row: x tile, x tile.
- Bottom row: x^2 tile, x^2 tile.
- Left side: x tile, 1 tile, 1 tile.
- Right side: $2xx + 4x$

2. Factor Algebraically

Look for the Greatest Common Factor of the coefficients and the GCF of the variables.

Ex.1 Factor: $8x^3 - 6x^2y^2 + 4x^2y$

The GCF of 8, 6, and 4 is 2.

The GCF of x^3 , x^2y^2 , and x^2y is x^2 . $xxx, xxyy, xxy$

$$8x^3 - 6x^2y^2 + 4x^2y = 2(4x^3 - 3x^2y^2 + 2x^2y)$$

$$= 2x^2(4x - 3y^2 + 2y)$$

3. Factoring by Grouping

Some polynomials do not have common factors in all terms. They can sometimes be factored by grouping terms with common factors.

Ex.2 Factor: $ac + bc + ad + bd$

$$\begin{aligned}
 &= c(a+b) + d(a+b) && \text{let } x = (a+b) \\
 &= cx + dx \\
 &= x(c+d) \\
 &= (a+b)(c+d)
 \end{aligned}$$

Factor

a) $5x + 25$

$$= 5(x+5)$$

b) $24xy^2 + 16x^2y$

$$= 8xy(3y+2x)$$

c) $5x(a+b) + 3(a+b)$

$$= (5x+3)(a+b)$$

d) $3t(x+y) - (x+y)$

$$= (x+y)(3t-1)$$

e) $m^2 - 4n + 4m - mn$

$$= m^2 + 4m - 4n - mn$$

$$= m(m+4) - n(4+m)$$

$$= (m+4)(m-n)$$

f) $5m^2t - 10m^2 + t^2 - 2t$

$$= 5m^2(t-2) + t(t-2)$$

$$= (t-2)(5m^2+t)$$

$$= (5m^2+t)(t-2)$$

$$= \text{let } y = (a+b)$$

$$= 5xy + 3y$$

$$= y(5x+3)$$

Factor

g) $3y^2 - 9y - 20$

 $= \text{No GCF}$

h) $3m^3n^2 + 18m^2n^3 - 12mn^2$

$= 3mn^2(m^2 + 6mn - 4)$

i) $4t(m+7) + (m+7)$

$= (4t+1)(m+7)$

j) $4y(p+q) + x(-p-q)$

$= 4y(p+q) - x(p+q)$

k) $3t(x-y) - (x+y)$

 No GCF

$= (4y-x)(p+q)$

Assigned Work:

p.202-203 # 1, 3bd, 5bc, 6def, 7, 8, 9, 10